

THE INVISIBLE CLASSROOM



Relationships, Neuroscience
& Mindfulness in School

KIRK OLSON

Illustrated by Chris Madden

Introduction

SCHOOL IS THE ONLY INSTITUTION THAT TOUCHES EVERY PERSON IN this country. Teachers have been influencing the development of students since the creation of formal classrooms, possibly by the Romans in the middle of the fourth century BCE. Over this long span of time, we have discovered a host of methods for passing on information to our students: lectures, Socratic questioning, classroom discussions, project-based learning, readings, homework, slide film and video presentations, and more—tools the visible classroom uses to transmit knowledge. In addition to these methods, many educators have a vague sense that there are other forces at work in their classrooms. Some of us instinctively use them to support and improve our teaching; others, myself included, have ignored these forces and suffered the consequences.

There are a host of dynamics operating below the surface of the visible classroom that have a strong influence on who learns what, when, and how. These factors are invisible but will cause trouble if they are ignored. For example, a teacher might have to deal with disruptive behavior caused by a student's pain and anger at the lack of connection to others, anxiety created when students feel unsafe, learning challenges worsened when students feel defeated

by high expectations without emotional support, and inattention increased by anxiety from events outside of school—to name only a few. These troubles are signs that the invisible classroom needs our attention. They can be alleviated once we can see what has been hiding in plain sight all these years.

The *invisible classroom* refers to the microscopic neural connections inside all of us and the hidden human connections among us. These webs of neurological and interpersonal connections create the context for teaching, learning, and living.

We can uncover and positively influence the invisible classroom for the benefit of our students, ourselves, and ultimately the whole of society by using the evolving principles from interpersonal neurobiology, the study of the way relationships, mind, and brain interact to create our mental lives (Siegel 2012b); positive psychology, the study of what is best with people and what goes right in life (Seligman 2002; Peterson 2006); and mindfulness, a simultaneously ancient and modern practice (Kabat-Zinn 2005). We don't have to wait for trouble to arise before acting. We can prevent trouble while we intentionally develop a better working and learning environment. It is not too much to say that learning to see the invisible classroom will help you begin to alter the formerly invisible forces and create an environment that supports learning. All of this is as true in kindergarten as it is in postgraduate study.

My goal in this book is to provide practical understandable principles drawn from research and experience, illustrate them with true composite stories drawn from the real imperfect world of education, and offer realistic guidance for applying them in the midst of the ongoing pressures of teaching. Hopefully the students in these stories will seem familiar, although their lives may appear more difficult than that of an average student. My role as psychologist allowed access into people's lives unavailable to other

professions. The hidden details and sometimes unsettling aspects of students' lives illuminated in the stories may not have been available to educators, but the principles illustrated by them are universal. We are all part of the web of interpersonal connections, and we are all blessed with the connections inside our brains.

Neuroscience: Begin with the brain. Teaching changes the structure of the brain in far more complex ways than any brain surgeon's scalpel. We educators don't need to study surgery to be able to teach, but a working knowledge of some basic brain processes helps us understand the puzzling aspects of some of our students and generally improves our teaching. There will be brief pertinent, understandable descriptions of brain functions as needed throughout this book.

Relationships: What's love got to do with it? Extensive research over many decades shows that from the first moment of birth, human brains are wired to learn best within the context of loving relationships. This does not change because children enter school, so cultivating a positive relational culture in your classroom and school supports learning and creates a better working atmosphere for you. I delve into the research on human connection so you can see how to apply it in the classroom with students and among staff. What's love got to do with it? Well, as you will see, everything!

Lead with strengths. Education focuses on discovering what students do not know, and then teaching it. This perspective has an unintended downside in that it can lead educators to minimize or ignore student strengths and passions. For educators and students alike, discovering and improving strengths leads to excellence and well-being. There is a growing body of research that supports purposely helping students find their strengths and shows us how to do it.

Anchor with mindfulness. Mindfulness is simultaneously ancient and contemporary. Its positive effect on the brain makes

it a useful daily approach to the classroom. Brain research clearly shows the benefit of mindfulness, and I discuss how to use it for yourself as well as in the classroom.

The research results we will explore are not obscure, isolated, ivory tower facts; they translate into down-to-earth, practical methods that have a consistent positive effect on students, staff, and parents alike, whether the students have daunting challenges and lives filled with tragedy or lives of normality or even privilege. The examples included herein are often drawn from experiences with difficult-to-teach students in various settings. Some of the settings are plagued with rural poverty, some are from more affluent suburbs. The state of mind when teaching these students, however, is applicable in any setting, with any student from kindergarten through university.

In Chapter 1, we begin by revealing the invisible aspects of our classrooms. Beginning with the brain, we discuss how learning about love, leading with strengths, and anchoring with mindfulness provide practical direction for creating a superb learning experience in your classroom.

Chapter 2 takes us into a consideration of the human nervous system's workings to investigate why it is critically important for our students and ourselves not only to be safe but to *feel* safe in our schools and classrooms. Neuroscience tells us that without this foundation, teaching and learning are dramatically impaired.

Building on the foundation of safety, in Chapter 3 we explore why human connection is necessary for learning. Far beyond a nicety of the classroom experience, humans are wired from birth to connect with each other, and this does not change when students enter school. When teachers and administrators attend to the human connections in classrooms and schools, people can flourish; when they don't, people can languish.

Chapter 4 explores the brain's top-down and bottom-up attentional circuits and how to use them to capture student attention and guide their minds toward learning.

Memory, the foundation of all learning, is the subject of Chapter 5. The chapter begins with an exploration of the differences between explicit and implicit memory and how they can either support or undermine each other. The discussion moves on to how memories are encoded, stored, and retrieved; how there is a complex relationship between stress and memory; and how adjusting our understanding of why some of our students struggle to remember information can help ameliorate their challenges.

Growing out of this brain science-based theoretical and practical foundation, Chapter 6 draws from positive psychology, the study of what is best in people, to explore the positive effect of balancing, helping students improve their weaknesses with nurturing their strengths. We will learn how and why a strength-nurturing approach can increase our students' learning as well as bring respect and connection to administration, faculty, parents, and students alike.

Practical applications of mindfulness, the nonjudgmental attention to the present moment, as a means for helping our students (and ourselves) find our center and open to new learning and warm relating is the subject of Chapter 7.

We put it all together in Chapter 8 as we circle back to the beginning, weaving the principles and practices of relationships, neuroscience, and mindfulness into the possibility of improving school and classroom culture.

In my experience, this approach works best if it begins at the top with administration, staff, and faculty practicing together the changes they would like to see with students. Often, these experiences alone begin to influence how we perceive our students, and

the classroom culture begins to shift even before we directly apply these new methods. My wish for educators is to find the deep satisfaction in the critically important hard work we do, side by side with our students settling into meaningful rewarding lives as they make positive contributions to our world in the years ahead.

Chapter 1

Uncovering the Invisible Roots of Learning

MY PICKUP TRUCK COMES TO A CLATTERING STOP IN THE SCHOOL parking lot. Through the windshield, I see small groups of students lingering outside in the morning sunlight. Some are chatting with each other; some talk and laugh with the principal; a young couple stands separately, showing the first signs of blossoming love; others are shooting baskets as they tease each other. I notice two boys running awkwardly toward my truck. Tucker is informally dressed in dirty overalls and work boots, Jimmy wears a sweater over a white shirt. Both are smiling.

Tucker (completing his morning ritual) laughs, yanks open the passenger door, and hops in: "I love your truck. Will you give it to me?" As I give him my daily answer and shoo him out, Jimmy, standing in his characteristic awkward stiffness, excitedly informs me that the insect order *Lepidoptera* (moths and butterflies) was named by Carl Linnaeus in 1735. He asks, "Do you know about all the species in that order?" I refer him to his biology teacher, who is also arriving, and he dashes to her car.

As I walk toward the school building filled with students placed here by the special education system because they could not be taught in other settings, I take a moment to reflect. How can there be so much joy and warm human connection among students who some believe are unable to connect and others consider simply unteachable? Why, with no formally assigned bus duty, are so many among the staff standing outside warmly greeting students every morning (even during the cold, dark days of winter)? How is it possible for Tucker, who last year was chronically angry and even injured a teacher in his previous school, to be laughing and joking with the school principal? For that matter, what happened to change the boy excited about *Lepidoptera* from someone so afraid he could not enter a school building without vomiting into a student who feels safe enough to eagerly greet staff in the morning?

The daily challenge of teaching students after many talented educators had tried their best and failed pushed me to look for potentially helpful research results from fields outside of education. I examined areas such as interpersonal neurobiology, positive psychology, social neuroscience, mindfulness, organizational development—anywhere an answer to the puzzle of students' challenges might be hiding. Because the research included infants, children, adolescents, adults, animals, organizations, and businesses, it has useful applications for all of us: students, teachers, administrators, parents, classrooms, and schools alike. It seemed the most helpful results could be roughly grouped into discoveries about neuroscience, relationships, strengths, and mindfulness.

Beginning with the Brain

What can recent brain research teach us about the roots of learning? In 2001, I began to be fascinated by neuroscience, particularly

interpersonal neurobiology (Siegel 1999, 2012a)—the study of how our relationships continually shape our brains. A good starting place for schools and teachers is to dedicate ourselves to learning about the core circuitry of the brain—not just the cognitive circuits but the relational and emotional circuits as well. This knowledge can be applied to understanding how teaching and learning can be enhanced by the quality of our relationships with each other, and thus we can create a school culture that supports excellence. In the process, we can begin to understand that students have patterns neurobiologically ingrained from their early experiences that can, for example, make it difficult for them to imagine school as a positive experience. In the case of difficult-to-teach students, I began to suspect that this negative perception of school might be adding an impossible load to the burden of their learning challenges.

For an example of how interpersonal neurobiology can inform our teaching, let's take a close look at Tucker, a student who came to my school after his previous teacher lost her temper and yelled at the school counselor and special education director, "I don't care how you do it, get this kid and his mother out of my class!" Tucker was physically large for a seventh grader; he saw no use for school; he hated reading, history, and math; sometimes he was interested in science; he loved to hunt and fish and often spoke of his father's gun collection and their hunting excursions. At home, he blamed the teacher for his poor grades. His parents had attended the same school when they were children, had hated it, and always believed Tucker's negative stories about his teacher and school.

How can neuroscience help us get Tucker (or any student for that matter) into a state of mind open to learning? In the late 1940s, psychologist Donald Hebb (1949) discovered a simple but profound neurological process. Anything we experience causes a network of neurons to fire. Imagine these complex networks of neurons that can span the brain and the body as resembling a fishing net. Like a

fishing net, each fiber is connected to every other fiber to create a whole net.

The more frequently the same net of neurons fire together, the more likely they will fire in the same pattern again. This is summarized in the phrase, "What fires together, wires together." This simple but profound process applies whether we are learning course content, discovering how relationships work, living our daily lives, or developing a sense of how school will be.

To understand how this neuroscience process can help you with your students, take a moment to imagine yourself in Tucker's life. As a young child, he heard his parents complain about school and tell stories of their negative school experiences. Every time he heard the complaints, a network of neurons fired in his brain, and the more often they fired, the more likely they would fire again in the same pattern. Without realizing it, his parents were creating an ingrained neural network in their son that led Tucker to expect that these same negative experiences would happen to him when he went to school.

Let's give this complex web of neurons the crude yet accurate name of the "school sucks" neural network. Over and over, his parents' stories unintentionally made the "school sucks" network fire and strengthen. Imagine Tucker on his very first day of school, with his wired-in "school sucks" network at the ready as he enters the building. Without his conscious knowledge, Tucker's brain is expecting negative experiences at school. In the multitude of small experiences that make up a day at school, he will certainly find some negative ones. If nothing else, he will interpret his normal first-day anxiety as supporting his "school sucks" neural net. Imagine him arriving home after his first day, saying something like: "That place is creepy. Those big kids are scary." His parents, triggered by their son's fear, share negative stories from their past at school. Tucker's "school sucks" network triggers his parents' "school sucks" net-

work and they strengthen each other. If nothing changes, the next day will be a repeat, further strengthening the negative network until the thought of school produces a feeling of dread and resistance through his whole body—hardly an ideal state for learning.

The thought of breaking through this kind of negative neurological cycle might seem hopelessly daunting. But this is far from the case because of another neuroscience discovery—*neuroplasticity* (Siegel 1999, 2012a; Schwartz and Begley 2003; Doidge 2007). Simply put, neuroplasticity is the brain's ability to change its pattern of neural connections throughout the life span. Neuroplasticity is a discovery from neuroscience that offers educators much hope, because unlike the outdated belief that the brain is static after about age seven, neuroplasticity shows that it is possible for anyone to change their neural networks with some effort and with support.

How Neuroplasticity Can Work for You

No matter how much you may want to, you cannot go inside Tucker's head with a pair of tweezers and disconnect his "school sucks" neural network. However, you can help students change old neural networks by creating more positive relational experiences for them at school. The change can begin, for example, simply by greeting each student individually, authentically, and warmly, allowing him or her to feel felt and seen by you. Taking an interest in his or her strengths and passions, no matter how different they are from yours, will let each student know you value him or her. Incorporating some aspects of mindfulness practice (described later) will help calm the fear that may be activating some of these neural networks. As these positive relational experiences are repeated, the old neural network will begin to be transformed into one carrying the new

experience. This process is called *memory reconsolidation* (Ecker et al. 2012). Part of Tucker's "school sucks" pattern is experienced in his body: his muscles get tense, his gut tightens, his heart speeds up at the very thought of going to school. In this state, he is primed to notice anything that is even a remote trigger of the "school sucks" network. He also has the anticipation that teachers will greet him warily, since that's what his parents described and what happened at his old school. All of this creates a state of mind that makes it nearly impossible for him to learn.

If instead, when he arrives, he is greeted personally with authentic warmth, that simple gesture will help his body begin to relax a bit. In that moment, the old network is being modified very slightly because of the difference between what his "school sucks" neural network led him to expect and what actually happened. This is called a *disconfirming experience*, an essential building block of the memory reconsolidation process. When we anticipate one thing but experience another, our future expectation can be modified slightly—sometimes a lot. By repeating these experiences daily, gradually large shifts in perception are possible. The beginning of creating a foundation for academic learning is establishing a relational environment that collaborates with the brain's natural learning processes. When kids feel safe and connected, the doors to learning open wide.

It begins for us educators by accepting students for who they are in any given moment—although we may not actually like who they are in that moment. This can be a difficult task, but anything other than personal acceptance increases fear and reinforces negative neural networks. For example, when Tucker first began attending my school, we did not try to convince him school is really important for his future or that he might as well make the best of it. We intentionally ignored these typical talking points. Instead, we encouraged him to join the outdoor education program and even

invited his parents to join him. Although they did not, the invitation was likely a small disconfirming experience for them, because it was an authentic invitation by school staff—people whom they had long considered negatively—to engage in an activity they have enjoyed. The staff members were told about the family's outdoor interests, so they looked for opportunities to swap hunting and fishing stories with Tucker's parents at various school events. These experiences and others began to add a "this school is different" or a "this school is okay" stream of information to the old neural network for the family.

A good deal of effort was made to repeat these experiences so the old neural network could continue to transform. There were ongoing one-to-one discussions about his interests, encouragement in classes, and offers for Tucker to have a voice in decisions about his classes. It is possible that these efforts at school might have triggered positive school-related discussions at home, further transforming the neural network holding his perception of school.

It is important to know that the "school sucks" neural network does not just vanish immediately; it takes time for many disconfirming experiences to weaken the network, just as it took many experiences to develop and strengthen it. During this process, the network may be easily activated by perceived negative school-related events, and when this inevitably happens, it is a temporary setback. But the ongoing repetition of positive experiences—intentionally created—continue to make the "this school is okay" neural network repeatedly fire and become stronger. In Tucker's case, as this new neural network became established, he began to feel safe and accepted, making room for him to anticipate positive events at school. From the foundation of the "this school is okay" network, we could help him build other positive neural networks that supported his learning. For example, we might build a bridge to new learning in biology with a project linking his knowledge about

game animals to related topics; in his history class, we could link his hunting and fishing passion to the lifestyles of the early American colonists.

Tucker is an example of how understanding and using neuroscience's basic processes and neuroplasticity gives us tools to create the kinds of experiences that have the potential to change habits of thought, feeling, and behavior that create obstacles to student learning. The details of students' experiences and their preexisting neural networks as they enter our classes vary widely. Neuroscience invites us to think about any attitude or belief that creates an obstacle to learning as a neural network that can be altered by creating positive relational experiences and disconfirming experiences for students.

Applying these and other research results is both demanding and exhilarating. In the opening chapters of this book, we consider discoveries about the autonomic nervous system and the importance of safety for learning (Chapter 2); explore the ways that warm connections prepare the brain to take in new information (Chapter 3); and learn about the neural processes of paying attention and remembering (Chapters 4 and 5)—all with many practical application ideas. At school, these have key places in the invisible classroom. How we see ourselves and our students prepares us to offer experiences that collaborate with the brain's natural learning process.

Leading with Strengths and Passions

Tucker's story alludes to a second avenue for creating a classroom culture in which learning becomes optimal: focusing on strengths and passions in addition to the remediation of weaknesses. In 2002, Marty Seligman published his seminal book, *Authentic Happiness*.

Seligman is credited with being the founder of positive psychology. He and several other psychologists realized that for over a century, the field of psychology had been answering the question: "What is wrong with people, and how can we help them improve their weaknesses and overcome their pathology?" He and his colleagues began to ask the question: "What is right with people, and how can we help them expand their strengths?" At my school, the staff took these concepts to heart, and we dedicated ourselves to uncovering and supporting expansion of our strengths and passions. We completed a number of assessments, experimented with several exercises developed by positive psychology researchers, and applied what we learned about each other during the daily life of the school. We formed faculty committee assignments based on personal strengths and passions rather than seniority or other reasons. For example, one teacher was passionate about role-playing games, so she began an after-school gaming club that has been very popular. We were so heartened by the results for both the quality of our work and the improvements in mood and relationships among the staff that we began to turn our attention to offering this strengths emphasis to the students. Here is what happened for one of them.

Gary was good-natured at home but would explode in anger at school and was barred from returning to his previous campus after injuring a teacher during a classroom fight. He arrived with his parents at an admission interview for our school surly, sullen, and angry. He appeared more prepared for a fight than an interview. His parents were shocked, saying he was fine on the drive to the school, but once inside the building he had a total change. We asked the questions we always ask first: "What are you good at? What do you love to do, in school or out of school?" He seemed surprised by the questions. We were stunned by his answer. He described waking up that morning before dawn and driving his snowmobile to the top of a local hill to watch the sunrise, returning before his parents woke

up. He poetically described the reds, blues, and grays of the winter sunrise. "It is where I find peace. Other times, I just walk into the woods and sit quietly, but the colors of the sunrise from that hill are amazing."

Those first questions uncovered his passion for the natural world. A *passion* is defined here as a very strong emotional attraction to something. An *interest* suggests an attraction to or curiosity about something but with less intensity than a passion. *Strength* is defined by British educator Jennifer Fox Eades: "Strengths are capacities to think, feel, and behave in certain ways. They represent what is best about us and when we use our strengths we are energized, we sparkle and soar, we achieve the highest goals we are capable of achieving" (Eades 2008, p. 34). People pursue a strength or passion for its own sake, often during their leisure time. Strengths and passions can be interwoven (but not always). For example, many adults I know are passionate about a sport such as basketball, tennis, or golf, but demonstrate that the sport is not a strength by not playing very well.

Suspecting Gary had strengths paralleling his passion for the natural world, we asked more questions, uncovering his skill at tracking animals, identifying plants and birds, and even cooking on an open fire. As the staff in the interview began sharing their own experiences hiking, biking, hunting, and skiing, they began to develop a strength- and passion-based connection with him. The glaring fact of his violence and his upcoming court case could have easily blotted out the beauty and color of his sunrise and the uncovering of his strengths, but the strength-focused questions allowed his light to shine. I will talk more about Gary later, but the point here is that focusing on strengths and passions can begin a process that has the potential to change even violent students' lives for the better. In the process of noticing strengths in ourselves and our students, our state of mind begins to shift from a primary focus on the

often arduous process of unearthing and improving student weaknesses to the explosion of energy that arises from discovering and expanding strengths and passions that are already present. (Chapter 6 explores the practical implementation of strengths-focused education in depth and offers many tools for you to use in your school.)

Anchoring with Mindful Moments

Side by side with the perspectives and processes offered by neuroscience and positive psychology, mindfulness offers tools to help students find a calm center from which to learn. *Mindfulness* is simultaneously ancient and contemporary; stated simply, it is the nonjudgmental attending to the present moment (Kabat-Zinn 2005; Siegel 2007). After hectic days in the classroom, the staff at my school began to experiment with bringing our attention into the present moment by sitting quietly and focusing on our breath for a few minutes at the beginning of faculty meetings. We then found that meetings flowed much more easily. The gatherings were more productive, and we felt better while doing it. Together, the staff decided to take the next step and introduce the students to a minute or two of mindfulness throughout the day. Over about a school year a structure evolved, where by staff and students gather each morning for a meeting that begins with a few mindful moments, and many classes begin the same way. As the mindful minutes became part of the school culture when a class became too disruptive the teacher simply had to say, "let's take a mindful moment" and the students quieted rapidly. This is the structure that works in the culture we developed in our setting, and each school and classroom can develop its own structure to add mindfulness.

Mindfulness practices build neural strength in the areas of the brain that allow us to focus and take in new information with less interference from wandering streams of thought, emotion, and external distraction. In addition, these practices build the neural capacity for caring relationships (Siegel 2007). Chapter 7 offers an in-depth exploration of mindfulness and resources for applying it in educational settings.

Building on a foundation of consciously offering safe, secure relationships for our students, we have found that the combination of applied interpersonal neurobiology and a daily emphasis on strengths, coupled with the anchor of mindful moments throughout the day, gives us a powerful trio of perspectives and interventions that can improve any classroom from kindergarten to university. At the end of each chapter, you will find Tools for School, offering practical applications for what we discuss. As you translate these suggestions into what works for you individually in your setting, I hope you will find ease and satisfaction in your valuable work.

Chapter 2

The Neurobiology of School Safety: Being Safe and Feeling Safe

MOST EDUCATORS BEGAN THINKING SERIOUSLY ABOUT CLASSROOM and school safety after the tragic school shootings at Columbine High School in 1999, not because it was the first but because that particular horror changed the world of education. In one tragic day, school went from a place of presumed safety to a place of potential danger and real anxiety. The change was abrupt, stunning, and sad for educators everywhere. In the haste to protect students, we increased physical safety, but also increased staff and student anxiety. Metal detectors, buzzing door locks, and safety officers in the schools became part of daily life, but these mechanisms of protection were also daily reminders that we needed to be protected.

Who and what did we need protection from? Outsiders attacking the school like what happened in Newtown, Connecticut, in 2012? Insiders (students) like at Columbine? Terrorists from other countries like September 11, 2001? When what was previously unthinkable became possible, potential danger lurked everywhere, making fear and anxiety part of daily life. Anxiety distorted edu-

cators' decision making, because any student could be a potential threat. School administrators asked psychologists from outside their schools to complete safety assessments on students who had done something that was common prior to Columbine, but post-Columbine these same actions had suddenly turned sinister. For example, I was asked to conduct safety assessments on a nine-year-old boy who forgot to take his jackknife out of his pocket at home and showed it to a friend at school; an angry ten-year-old girl who wrote B-M-O-B (misspelling *bomb*) on the girl's room wall; a seven-year-old boy who brought a rusty unworkable pistol he found in the cellar of his grandfather's barn into school for show and tell. All were suspended from school until the safety assessment was complete.

As these examples of the misinterpretation of student behavior demonstrate, when the neurobiology of fear is active, our thinking narrows, turns rigid, and becomes focused on the perceived threat. When the fear circuits of the brain are active, clear-headed decision making and new learning is difficult or even impossible. What is needed in addition to physical safety is emotional safety, the internal felt sense of being safe. The mechanisms of protection like locks, metal detectors, and security cameras help us and our students be as safe as possible. They are necessary, but these mechanisms are not sufficient to create emotional safety.

As we move toward the basics of a neurobiology of safety, let's consider the important distinction between *being* safe and *feeling* safe. The harsh reality is that we can never be sure our children are 100 percent physically safe; in spite of this we can and should create a school culture where students and staff feel safe so learning can occur.

The school tragedies show us that, like Maslow's (1954) hierarchy of needs, physical safety is only the beginning. As you may know, Maslow's hierarchy is usually shown as a pyramid begin-

ning with the most basic needs at the bottom and progressing to more complex needs at the top. Physiological needs such as breathing, food, and water are at the bottom. Safety is the level above the basics that support life. Love and belonging needs are at the level just above safety, and they are followed by self-esteem needs (e.g., respect of self and achievement). The hierarchy culminates at the top with self-actualization (e.g., the process of individual growth and reaching one's full potential). Although the hierarchy is no longer considered a rigid step-by-step progression (it is generally agreed that all the needs at one level need not be met before moving on to the next), Maslow's hierarchy shows us that physical safety is a necessary part of the foundation of a school and the sense of belonging and connection, providing the additional layers that help all members of a community settle into a comfortable openness with one another.

interpersonal environment
The most basic layers of being safe are the physical measures (locks and alarms) installed for safety. Feeling safe depends on our interpersonal environment, possibly more so than our physical environment. The most basic measures for feeling safe in our interpersonal environment are the policies designed to prevent discrimination, sexual harassment, and bullying. These protections are only a notch above metal detectors; they are designed to prevent negative things from happening and instruct us what to do if they do happen. Only by intentionally and continually developing trust, tolerance, and the acceptance of differences will we arrive at a school culture that feels safe and is fully supportive of learning. Emotional safety depends on mutual trust and trust in an organization begins at the top: between administrators and teachers, and it then is communicated by teachers to their students.

The connection and attunement between teacher and student is critical for students to feel safe in the classroom. Louis Cozolino explains it well: "From the neurobiological perspective the position

of the teacher is very similar to that of a parent in building a child's brain. Both can enhance a child's emotional regulation by providing a safe haven that supports the learning process. . . . Among the many possible implications of this finding for the classroom is the fact that teacher-student attunement is not a 'nice addition' to the learning experience, but a core requirement" (2013, p. 18).

attunement

Wiring for Safety

Thanks to the work of Stephen Porges (2011), we have a more complete understanding than ever before of how our autonomic nervous system (ANS) is central to our experience of feeling safe. The ANS is a control system that operates below the level of consciousness. It originates in the brain stem and has connections throughout the hollow organs (e.g., heart, lungs, stomach). It is divided into three subsystems: the sympathetic nervous system (a rapid-response mobilizing system) and two branches of the parasympathetic system, both of which are slower to respond and quiet our systems. As part of the innate functionality that ensures our survival, these systems are rapidly and profoundly responsive to our environment, including the internal state of those around us. The ANS, along with other neural circuits, is constantly scanning, in about quarter-second increments, to determine whether we are safe. Humans particularly find safety with fellow human beings, and so we attend to them to determine if they are with us or separated from us. When we have the sense that the people around us are accepting, curious, predisposed to believing we are doing the best we can (and therefore largely not judging us), and willing to be helpful, we have a felt sense of being safe. When we sense criticism or judgment, anxiety, anger, or disinterest, we feel unsafe. For example, think how your body might respond when you were openly and warmly welcomed

as you entered a good friend's home. Now contrast that response to how your body might feel as you enter a room full of stern-faced well-dressed school board members.

Porges coined the word neuroception to explain how most of this instantaneous response occurs. It is nonconscious—outside of our conscious or perceptual awareness—yet it influences our future actions. Your neuroception of welcoming friends influences you to feel safe in your time together and will make it comfortable to share your intimate thoughts and listen attentively. Your neuroception of a room filled with stern school board members will influence your response as well, probably making you feel unsafe and guarded about sharing personal thoughts and feelings, as well as cautious while listening to theirs. In both instances, neuroception is working nonconsciously without our knowledge, but sometimes there is a sudden jolt that brings us quickly from nonconscious neuroception to the conscious awareness of danger. This shift might occur when there is a sudden loud noise in an otherwise quiet room or when an especially intimidating school board member aggressively confronts us. If we have a neuroception of safety, our system wants to open, step closer, and engage. If we have a neuroception of being unsafe, our system is designed to tighten, close down, focus on the potential threat, and take some action for protection—to fight or flee if action seems likely to help us (e.g., avoid the intimidating school board member). Sometimes there appears to be no action that will protect us, we feel helpless and our neuroception triggers us to collapse. In these responses to various degrees of fear and helplessness, a student or colleague may lash out verbally or physically, or collapse in a heap (e.g., become unable to speak in the presence of the intimidating school board member).

What factors go into these instantaneous assessments of our surroundings? One source of input are the cues we receive from the people in our immediate environment. We sense physical

Cues - signals

safety from nonverbal signals that primarily flow from the faces, voices, eyes, and bodies of those around us. Their (and our) inner states are expressed in tone of voice, the degree of relaxation in face, the dilation of pupils and expression in the eyes, rate of breathing, and the ease of movement in the body.

implicit memory
primary biological drive

The second powerful source of input comes from our previous life experience. In our early life and then throughout our lives, experiences become encoded in our memories in a way that produce the expectation that what happened in the past is likely to occur in the future. For example, if one has had a lot of fearful experiences at school, one would expect the next school encounter to have a similar flavor. The memory of past experiences "colors" responses from inside, regardless of what is actually happening in the external environment. However, as considered deeply in the next chapter, we are always on the lookout for ways to connect with others—a primary biological drive—so our system is also biased in the direction of seeking connection. If those around us are able to offer a safe haven, we have a tendency to move in that direction. This gives teachers a big advantage if we become that welcoming harbor for students.

Circuits of Trust and Safety

*neuroception
perception*

Developing an understanding of the details of the ANS can help us build the foundation for creating a safe and supportive environment for students so they may have a neuroception similar to entering a friend's home as they enter the classroom. The ANS has three branches that work together in a hierarchical order:

- VENTRAL VAGAL*
1. The ventral vagal parasympathetic branch—the default mode. When we have a neuroception of safety, the circuitry

ventral vagal parasympathetic
sympathetic
dorsal vagal parasympathetic

- of social engagement and optimum learning is active and remains so until we don't have a felt sense of safety.
2. The sympathetic overrides the ventral vagal branch. When we have a neuroception of danger and believe we can defend ourselves, this branch activates the fight-flight-freeze response.
3. If the danger escalates to the point that we begin to feel helpless, the dorsal vagal parasympathetic branch overrides the sympathetic. The neuroception of helplessness tells us that we are in danger of dying, so we move in the direction of feigning death to avoid death—a state in which all systems slow down so much that our consciousness begins to fade and we may collapse, dissociate, or faint.

What is described here is how the sympathetic and dorsal vagal parasympathetic branches adaptively respond to danger. However, when we have a neuroception of safety, these two branches can work with the ventral vagal to support states of play and joy (sympathetic) or states of deep rest and contemplation (dorsal vagal parasympathetic). *How they work together*

Our whole system has a preference for being in the ventral vagal parasympathetic state because it allows us to stay in connection with one another and co-regulate each other, so it is the human default mode. In fact, according to social baseline theory (Beckes and Coan, 2011), we have such a preference for interpersonal connection that our fear system doesn't activate nearly as much when we are accompanied by someone we trust. Our ventral vagal parasympathetic system assumes the other person "has our back." When there is this kind of interpersonal trust, our nervous systems do not have to be as alert for danger and thus have a lot more energy for learning, creating, and exploring. When colleagues and administrators support us, it makes it possible for teachers to flourish. When students feel it from their teachers—for example,

experiencing an authentic calm warm welcoming at the classroom door—it can be the difference between success and failure, particularly for those who come to us with shaky nervous systems.

Help Yourself: Begin with the Ventral Vagal

Because humans prefer the ventral vagal state, starting the class by being in this state ourselves offers students an open door for calming, connecting, and settling into learning, even for those who carry a lot of anxiety and upset from outside school. In the ventral vagal state, our bellies and faces will feel more relaxed and our heart rate will be moderate because of the engagement of what is called the vagal brake that slows the heart. We have a sense of calm alertness and readiness to engage, as well as a greater ability to read students' faces. We are likely to feel playful, curious, and caring toward our students (Panksepp and Biven 2012) and their neuroception of our state influences their inner states to move in the direction of matching ours.

How can we recognize, nurture, and learn to maintain this state? Creating or working in a school culture where we can be sure that fellow teachers and administrators have our backs is one important way to help maintain this state. Another individual technique for stepping into the ventral vagal state is to focus on our breathing, allowing the exhale to be a little longer than the inhale. At the end of every exhalation, there is a natural pause before we breathe in again, a kind of tidal rhythm. The practice of focusing our attention on our breath and noticing these pauses when we are away from the stresses of school can strengthen the calming pattern so that it will be more reliable when we need it. (Additional mindfulness practices like this are addressed in detail in Chapter 7.) Remem-

ber, when our students come through the door, their brains will be scanning for safety roughly every quarter of a second, and encountering a face and body that is settled and receptive can give their day a solid beginning. As our ventral vagal state helps students' ventral vagal system come online, a classroom-wide feedback loop of vagal connection and openness has a chance to develop.

The stresses of school (and the world in general) can often give teachers and students a push toward sympathetic activation, brought on by a neuroception of danger. Heart rates accelerate, eyes widen, bellies tense, tone of voice and eye gaze change, the ability to read the faces of others diminishes, thinking loses its flexibility (nuances are not recognized), and focus narrows to attend only to information related to the perceived threat (Fredrickson 2009). The social engagement system turns down, so we can no longer co-regulate each other. New learning nearly stops. All of this sympathetic activation is adaptive in threatening conditions, but problematic in the classroom.

For humans, disconnection is felt as a threat. As we become more attuned to our inner states, we can more easily sense when we have moved into this kind of sympathetic activation, call on our breathing practice, and possibly connect to a trusted colleague to find our way back to the ventral vagal state. We can intentionally develop a personal repertoire of pathways that help us notice the shift toward sympathetic arousal, identify the perceived danger, and move back toward a neuroception of safety and the interpersonal engagement of the ventral vagal. In addition to it being vital for students, spending more time in this ventral vagal state means we will be less tired and emotionally drained at the end of the school day.

Many of our students currently face daily stresses at home and anxiety from our fast-paced crisis-oriented society, in addition to the huge amount of information they must process at school.

Consider the possibility that students may have experienced earlier traumas, and then the power and importance of offering a setting that encourages a ventral vagal state grows in importance.

The Third Branch

neuroception of danger & helplessness

We should also consider the third state in the hierarchy of the ANS branches: the dorsal vagal parasympathetic, which is brought online by a neuroception of danger while simultaneously feeling helpless. The body interprets this state as a signal that we may die and begins to prepare for death by drastically slowing all systems—heart rate, breathing, attention, connection to others, and even awareness of the external environment. This is a state of collapse, dissociation, and dramatic disconnection. When we feel shamed or humiliated, we are moving toward a dorsal vagal state—collapsed chest, downturned eyes, inability to respond. This state can occur when someone is the victim of bullying. For example, early in my career I worked in a school where the walls of the school office often shook as the school principal yelled at students or teachers, shaming them for some infraction. I observed students and teachers alike silently shuffle out of his office with downturned eyes, collapsed chests, and stunned expressions. With the benefit of hindsight, I can now see their response as the adaptive working of the dorsal vagal parasympathetic branch of the ANS in the face of helplessness during these tirades. Have you seen similar responses in students who have been bullied? Victims of bullying often feel helpless because they cannot fight back against the bully, nor can they enlist the help of a teacher because they believe it will anger the bully and make the episodes worse. When they feel in danger while they simultaneously feel helpless, their normal dorsal vagal response gives them that “beaten down” look common for victims of bullying.

A person may combat the feeling of collapse with defensiveness or anger, rising into sympathetic activation as a way to escape the helplessness. Although this results in a more active state, it still prohibits connection with others and continues the pattern that makes learning all but impossible. Since school is a place where many students have already experienced shame in some form, understanding this cycle and building the capacity to respond differently, even in the face of anger and defensiveness, can offer a disconfirming experience and a pathway back to ventral vagal connection for the previously humiliated or bullied students.

People are particularly vulnerable to the dorsal vagal state if they have experienced shame, humiliation, or trauma as young children, and, no doubt, some of our students and some of us educators have. With this in our background, many of us, through no fault of our own, may fall into a helpless state more easily than do others. Having warm, safe connections among school staff provides good protection and potential healing from these earlier wounds, particularly when we have built trust by feeling safe enough to share our vulnerabilities with trusted colleagues. For students, our awareness of what may be happening can help us become the refuge they need to find their way back into connection and the ventral vagal state. Remembering that each person is seeking to remain in the ventral vagal state whenever possible can give us the confidence to remain supportive when students struggle with shame and collapse by exhibiting difficult behavior.

Flexible Responding

You have probably noticed that some students struggle with finding the calm state of their nervous systems. I have often wished that simply saying “calm down and behave!” would help them regulate,

but of course it usually doesn't. When they become agitated, angry, intrusive, or nonresponsive, it may be that their previous life experience has left the circuits that allow them to calm themselves poorly wired into the circuits that are experiencing the upset. When the proper wiring is in place, these key connections create a much longer and slower processing path for new and potentially frightening information. For example, if there is a loud noise in the classroom, the longer circuit with its better connections will give some students the time they need to evaluate the level of threat—did someone drop a book, or has an intruder burst in the door? The students without these connections are much more apt to react strongly and rapidly to the noise because their neurobiology doesn't give them access to a broader evaluative perspective. They move quickly into fight or flight, and their behavior follows this message from their nervous systems. It will also take them longer to calm themselves.

A longer circuit provides for both body (ANS) and emotional regulation (see Siegel 2007 for a description of this aspect of neural integration). It also gives us a quality called *response flexibility*, which is the ability to slow down and change course away from emotional reaction and toward a more empathetic relationship with others. We become less afraid and more able to see the big picture and be aware of the needs of others along with our own. The initial wiring of these circuits takes place very early in life, and when there wasn't enough support available from parents or other people caring for a child, he or she enters school with less capacity to self-regulate. Neuroplasticity offers us hope for these students.

Fortunately, we humans can "borrow" someone else's prefrontal cortex to support our own at any stage in life. Teachers in a ventral vagal state become similar to a lending library of neurobiological connectivity for those students who may have less than optimal circuitry. With ongoing support, neuroplasticity enables these students to gradually develop the missing wiring. For example, some

special educators working with impulsive, behaviorally disordered students have seen hints of this underlying process when they describe acting as if they were an "external brain" for their students. This process is usually thought of as a teacher acting as an external supporter of regulation of the internal impulses of some students. It can be quite meaningful for educators to sense that we are helping our students build and repair their brains after they didn't get what they needed earlier in life.

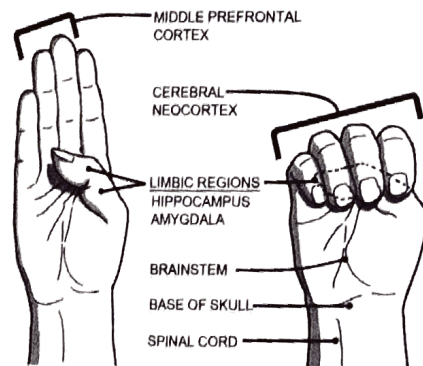
Illustrating the Neurobiology of Safety: Brain in Your Hand

Dan Siegel (1999, 2012b) demonstrates these interpersonal neurobiology concepts with the brain made from his hand. First, we make a fist with our thumb tucked inside—this represents our brain! From the bottom up: our arm represents the embodied parts of our brain in the belly, heart, and the ANS; our wrist represents the spinal cord as it enters the skull at the brain stem (the lower palm of our hand); our enclosed thumb represents the limbic region (roughly described as the emotional/social region of the brain). The fingers that enclose your fist represent the cortex, which is the outer surface of the brain, and the fingernails of our middle and ring fingers represent the middle prefrontal cortex (a connected group of regions that processes social information, autobiographical consciousness, evaluation of meaning, and other higher order cognition). Notice that the tips of your fingers touch the lower part of your palm (the brain stem), illustrating how the middle prefrontal cortex is connected to the brain stem's fight-flight-freeze center and, under your fingers, to the thumb's limbic region.

We can use this hand model to visually describe the effect of the perception of danger on the brain. When the brain stem (palm) is activated by an internal or external alarm, these lower brain

regions take over. You can show this by slowly opening your fist to demonstrate the disconnection of the middle prefrontal cortex from the brain stem. In the quest for simplicity and dramatic effect (I'm taking some poetic license yet still being neurologically accurate): As the alarm system of the brain turns on, your cortex, "the logical thinking part of your brain," becomes quiet because in danger we need to act quickly, and the lower regions of the brain take over to help you protect yourself. You can say and do things "without thinking." This is why people say and do things when they are angry and regret it later when their middle prefrontal cortex comes back on line (slowly close your fist). See Figure 2.1 for more details. This simple yet profound demonstration can have powerful effects for students and teachers.

Figure 2.1 HAND MODEL ILLUSTRATION



© 2012 by Mind Your Brain, Inc. Used with permission by Daniel J. Siegel, MD

A number of years ago I described the hand model to the faculty in an after-school workshop. The next day I was walking through the school with the principal when we saw a new student in the hall. The principal said to the girl, "Tell Kirke what we talked about earlier." She rather shyly and hesitantly held up her fist in the hand model of the brain, limbic thumb tucked into

her palm, cortical fingers wrapped around her thumb and said, "Today has been a difficult day—it's been a sprinkler day." Both of us were perplexed and must have shown it nonverbally because she slowly and repetitively opened and closed her fist spreading her fingers as she did. You can try it yourself now and you will see it looks remarkably like a classic lawn sprinkler. She used the hand model as a form of sign language to describe her fluctuating moods and in the process of noticing, describing, and sharing it with us, actually supported development of the very circuitry that was troubling her that day.

The hand model can be a useful tool in the day-to-day life of a school, communicating to colleagues and students in a modified sign language when the sympathetic nervous system's fight-flight response is beginning to overrule the ventral vagal parasympathetic state.

From the Top Down: Be the Change You Want

The brain's perpetual scanning to assess safety and the nonconscious working of neuroception means that educators must work diligently to keep the ventral vagal parasympathetic branch of the ANS active and return to this state when they get thrown off. When it begins to dissolve and the sympathetic system comes online, less and less learning can happen. In other words, for learning to take place, it is important to keep the fist on our hand model closed. At this point you might legitimately ask how you can possibly accomplish such a feat

Creating a school culture of felt safety and trust begins with the teachers and the administrators, not the students. If teachers and administrators do not feel safe with and trust each other, it is neurobiologically difficult or maybe impossible to create an authentic,

safe, trusting culture for our students. “Do what I say, not what I do” is neurobiologically problematic when we want to develop a culture of trust and safety. In Chapter 3 we discuss mirror neurons, but for now I will just say that our nonconscious, nonverbal communication with our students powerfully influences whether their neuroception assesses us as trustworthy and feels safe in our classroom. Even more important to understand is what we communicate to our students by unconscious nonverbal means springs from our inner state. Trust and sense of safety radiates nonconsciously from us to our students, and feeling safe and trusted at school ourselves makes it more possible to create an ongoing stream of welcoming safety for our students.

Trust, Vulnerability, and Daring Greatly

A brief sojourn into Brené Brown’s (2010, 2012) work may be of some help in understanding these concepts. Please note that the discussion focuses on the inner state, action, and attitudes of the people at the top, and less on their policies, announcements, and directives. People in the positions of superintendent, principal, dean, or headmaster are models for the staff as certainly as teachers and parents are models for children.

Brown has been investigating the nature of trust through research and personal experience over the past few years. She says, “Trust is a product of vulnerability that grows over time and requires work, attention, and full engagement: Trust isn’t a grand gesture—it’s a growing marble collection” (2012, p. 53). You are probably familiar with the marble jar as a way to encourage positive behavior in the classroom; in case you are not, this simple technique starts with an empty jar. When children behave well, the teacher adds marbles

to the jar; when they misbehave, she removes marbles. The level of marbles in the jar ebbs and flows and once it is full, there is a celebration. Trust is like the marble jar—each small act adds or sometimes subtracts from the total. How do we develop trust in a school? Brown summarizes the paradox well: “We need to feel trust to be vulnerable and we need to be vulnerable in order to trust” (2012, p. 47).

We might be tempted to imagine that developing trust requires us to be in some kind of impossible-to-attain state of complete agreement among all of the members of a school staff, but this is far from the case. To get a better sense of what this means, let’s consider that in the definition of trust: “reliance on the character, ability, strength, or truth of someone” (*Merriam-Webster Free Dictionary* 2013). There is no mention of agreeing with the people you trust. A robust discussion among professionals who bring into the debate diverse characters, abilities, strengths and personal truths can increase the sense of trust among them because the common focus on student learning takes competition and defensiveness out of the conversation, leading to a mutual felt sense of safety.

If vulnerability seems antithetical to leadership, I refer you to two of the most well-known writers and thinkers in the business leadership world: Robert Greenleaf and his articles and lectures on servant leadership from the 1960s and 1970s compiled into book form (Frick and Spears eds. 1998-1977) and any of Peter Drucker’s many books. Using different terminology, they discuss how leadership and vulnerability meet. Whether it is Greenleaf’s frustration with educational leadership in the late 1960s (Frick and Spears eds. 1998) or Drucker’s (2006) advice on managing ourselves, you will see that effective leadership begins with the internal qualities of openness, listening, and receptivity in the leader, not on manipulative techniques to bring others into line with his or her agenda.